



# **UUI: Reusable Spatial Data Services in Unified User Interface at NASA GES DISC**

<http://disc.gsfc.nasa.gov/uui/>

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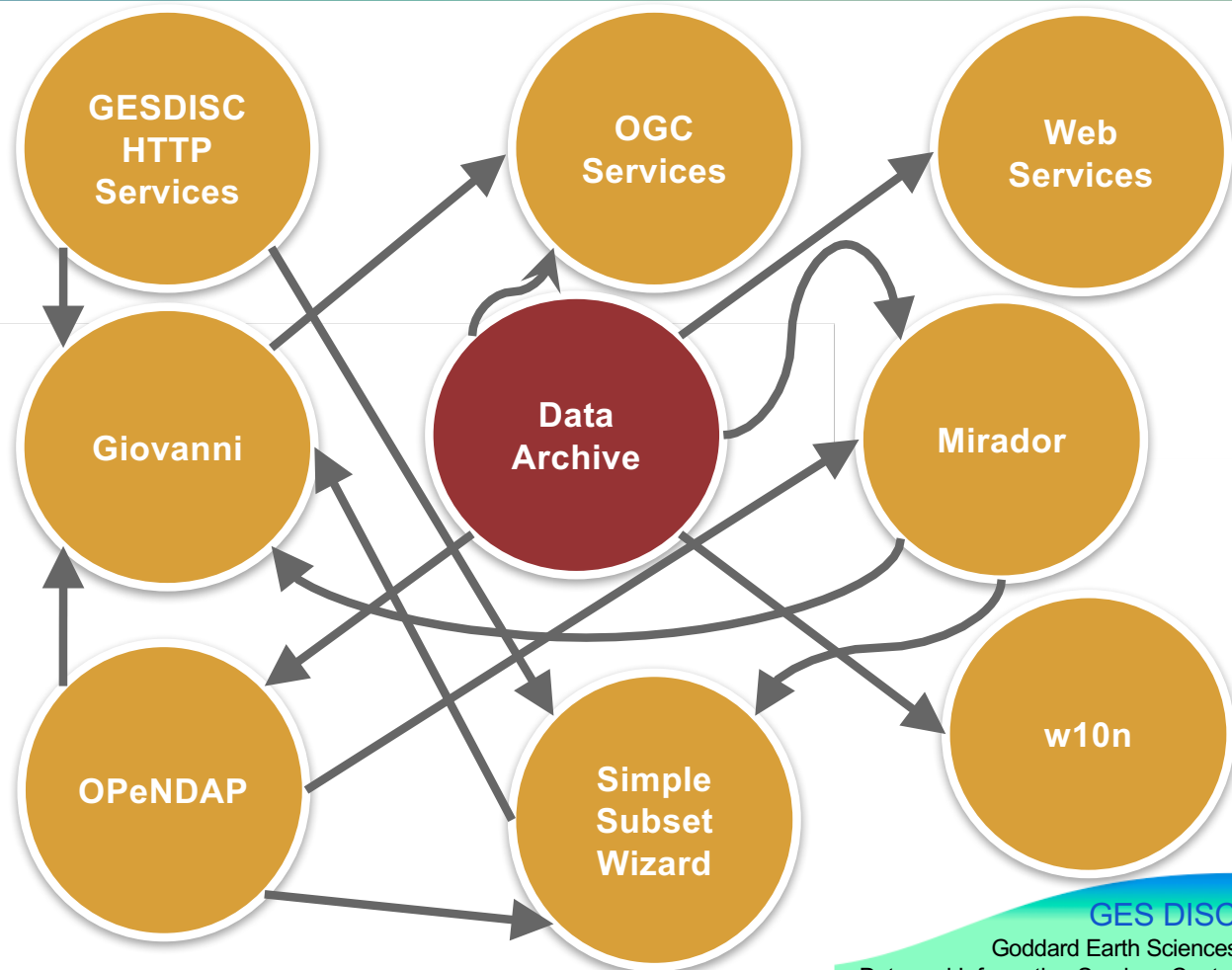
2016 AGU Fall Meeting, Session IN040, 16 December 2016

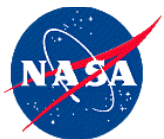
**GES DISC**  
Goddard Earth Sciences  
Data and Information Services Center



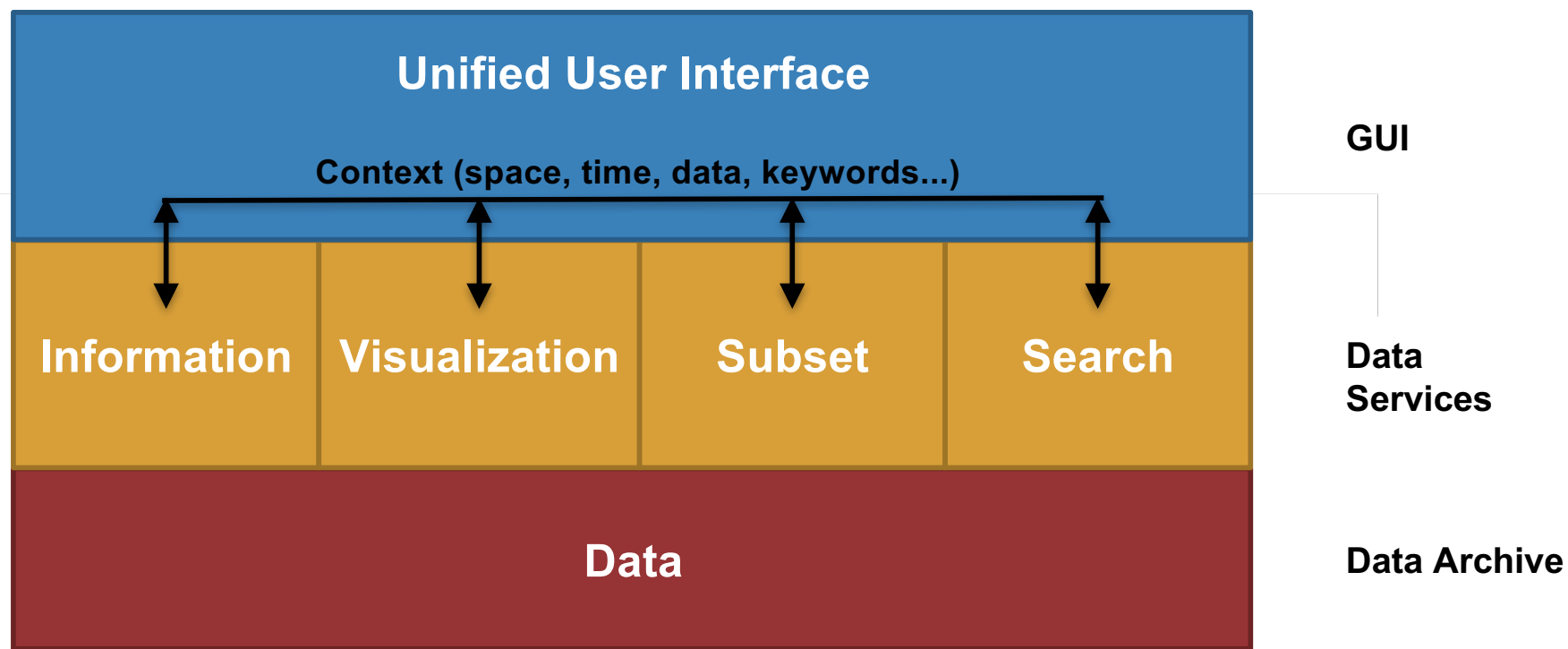
# Data Services at GES DISC

- GES DISC is a data center that provides access to large-scale archives of earth science **data**
- Also **applications** and **services** built on top of the data





# Going forward





# Unified User Interface (UUI)

GES DISC <sup>BETA</sup>

Atmospheric Composition, Water and Carbon Energy Cycles -> Climate Variability

Search: merra

Alerts Feedback Help Login

Back to Classic

Data Collections Related Documentation

Refine By

Subject Sort

- Altitude (162)
- Atmospheric Chemistry (20)
- Atmospheric Pressure (14)
- Atmospheric Radiation (124)
- Atmospheric Temperature (145)
- More...





Measurement Sort

- Barometric Altitude (144)
- Cloud Properties (118)
- Evapotranspiration (6)
- Geopotential Height (18)
- Heat Flux (124)
- More...

Source Sort

- Models/Analyses MERRA (215)
- Models/Analyses MERRA 2 (93)
- Models/Analyses MERRA-2 (2)
- Models/Analyses Noah-LSM (3)

Showing 1 - 32 of 316 datasets associated with merra for date range 1920-01-01 to 2016-06-01

Image	Dataset	Source	Temporal Resolution	Spatial Resolution	Process Level	Begin Date	End Date
 Hover	MERRA-2 const_2d_ctm_Nx: Constant Model Parameters for Usage by CTM V5.12.4 (M2CONXCTM.5.12.4) - Altitude	Models/Analyses MERRA-2	1 constant	0.5 ° x 0.625 °	4	1980-01-01	present
 Hover	MERRA-2 const_2d_ind_Nx: 2d, constants Land Surface Diagnostics V5.12.4 (M2CONXLND.5.12.4) - Atmospheric Temperature	Models/Analyses MERRA-2	1 constant	0.5 ° x 0.625 °	4	1980-01-01	present
 Hover	tavg1_2d_mld_Nx: MERRA Simulated 2D Incremental Analysis Update (IAU) MERRA-Land reanalysis, GEOSIdas-MERRALand, Time Average 1-hourly V5.2.0 (MST1NXMLD.5.2.0) - Clouds, Atmospheric Radiation, Atmospheric Water Vapor	Models/Analyses MERRA	1 hour	1.25 ° x 1.25 °	4	1979-01-01	present
 Hover	tavgM_2d_mld_Nx: MERRA Simulated 2D Incremental Analysis Update (IAU) MERRA-Land reanalysis, GEOSIdas-MERRALand, Time Average 1-hourly V5.2.0 (MST1NXMLD.5.2.0) - Clouds, Atmospheric Radiation, Atmospheric Water Vapor	Models/Analyses MERRA	1 month	1.25 ° x 1.25 °	4	1979-01-01	present

History

Search/find/navigate  
**ANY DATA RESOURCE**, while retaining **CONTEXT** for cross-resource  
**SEAMLESS NAVIGATION:**

- Data granules
- Data subsets (in bulk)
- Data visualization in/from Giovanni
- Data Documentation
- Dataset Landing Pages



story Goddard Earth Sciences  
Data and Information Services Center

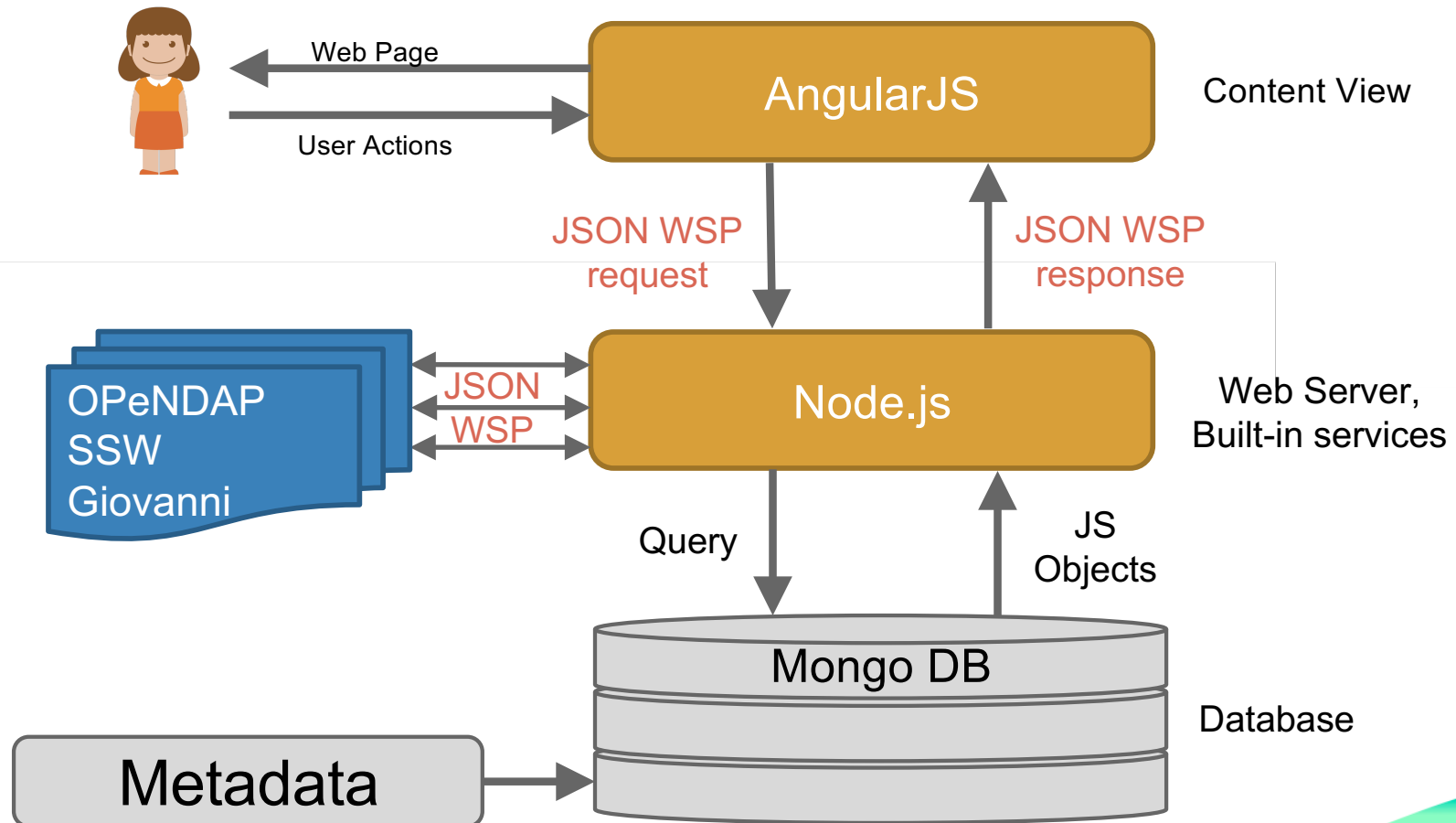


# Services

- Build around a notion of web services
  - Small, self-contained, web-accessible building blocks
  - Can be reused and chained to build more complex services
- Each service provides a well-defined specification
  - Allows for an easy verification, integration, maintenance
  - JSON WSP as a main vehicle, enhanced based on ...
  - OpenSearch / GEO and OGC WPS recommendations
- Legacy services wrapped in JSON WSP



# Architecture



CMR,  
Legacy  
metadata



# JSON WSP

## JavaScript Object Notation Web-Service Protocol

### Specification

```
{ "type": "jsonwsp/description",  
  "version": "1.0",  
  "servicename": "Keywords service",  
  "url": "http://disc.gsfc.nasa.gov/uui/  
    service/keywords/jsonwsp"  
  "methods": {  
    "getSynonyms": {  
      "doc_lines": ["Returns synonyms"]  
      "params": {  
        "keyword": {  
          "doc_lines": ["a keyword"],  
          "type": "string",  
          "optional": false  
        },  
      },  
      "ret_info": {  
        "type": ["string"]  
      }  
    }  
  }
```

### Request (POST)

```
{ "type": "jsonwsp/request",  
  "version": "1.0",  
  "methodname":  
    "getSynonyms",  
  "args": {  
    "keyword": "AOD"  
  }  
}
```

### Response

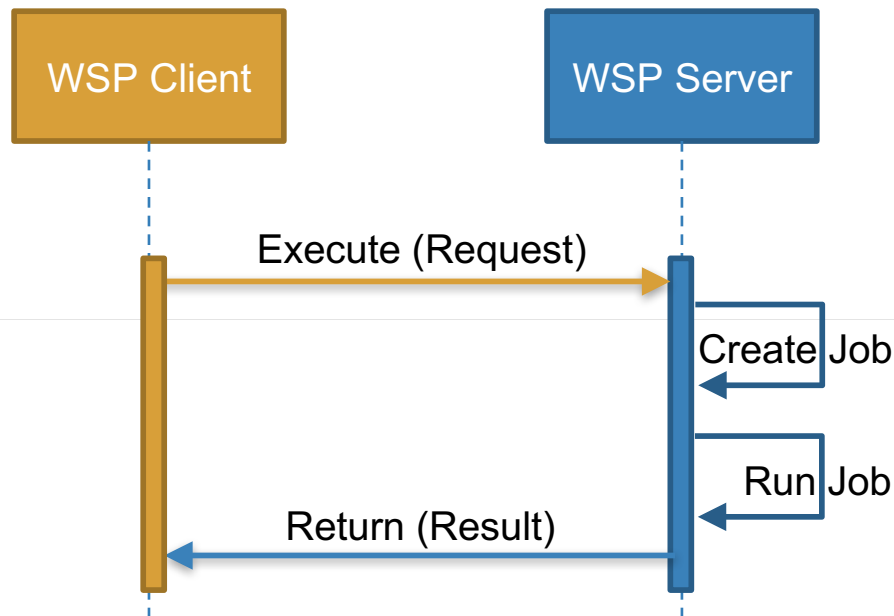
```
{ "type": "jsonwsp/response",  
  "version": "1.0",  
  "servicename": "Keywords service",  
  "method": "getSynonyms",  
  "result": ["AOT",  
    "Aerosol Optical Depth"]  
}
```

- Request params named based on OpenSearch/GEO
  - start, end, box, etc
- Response is formatted based on OpenSearch as well
  - totalResults, startIndex, items etc.

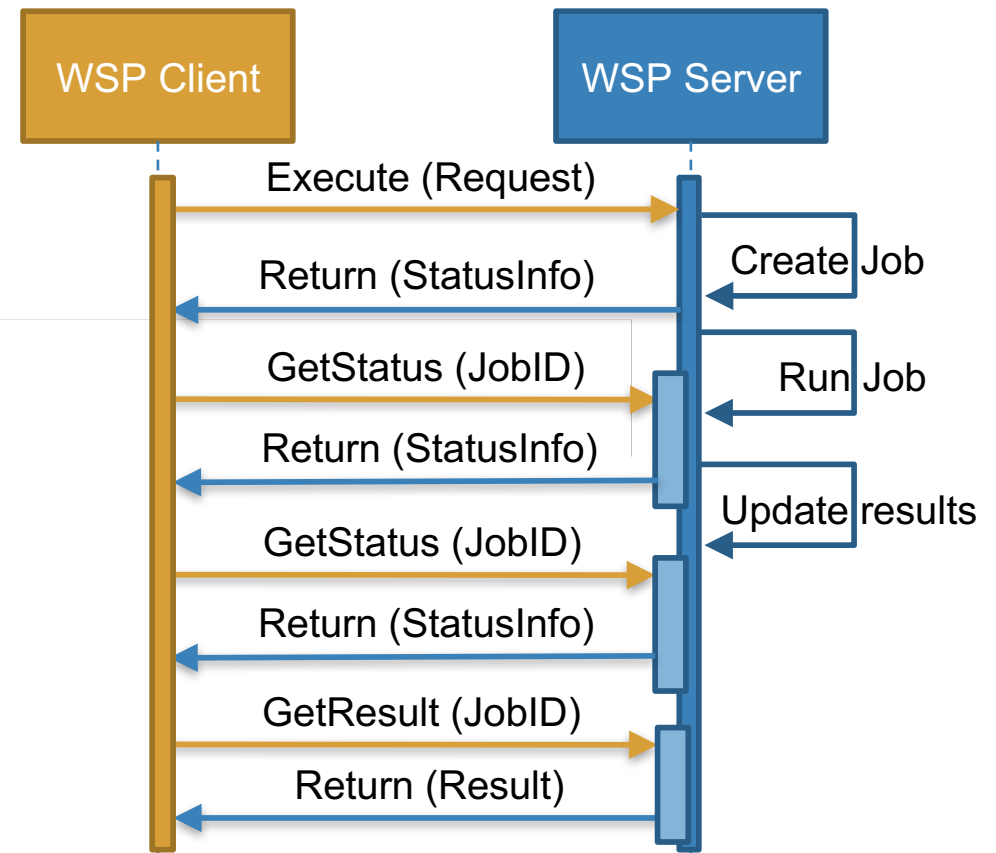




# Service interaction – OGC WPS



Synchronous Job



Asynchronous Job

Source: OGC® WPS 2.0 Interface Standard



# Service composition and reuse

- Services are simple POST calls with parameters in => results out
- Easy to wrap as a function in many languages supporting JSON (JavaScript, Python, Perl, etc.)
- Wrapper function can be used as a building block to construct complex services
  - ... Search for data
  - Then Subset the data
  - Then Process the data
  - Then Plot the data ...



# Reuse by External Clients

Plots

<< Back to Browse Events

## Cyclone Jasmine

2012-02-04 - 2012-02-20

Categories: Severe Storms

Location (West, South, East, North)\*: [-179.4,-36.2,178.5,-6.699999999999999]

### Suggested Datasets

Score	Short Name	Version	Title	Covers event	In Giovanni	2D
0.13	TRMM_3B42	7	TRMM (TMPA) RAINFALL ESTIMATE L3 3 HOUR 0.25 DEGREE X 0.25 DEGREE V7 (TRMM_3B42) AT GES DISC	✓	✓	✓

### Suggested Variables

Score	SDS	Title	2D
0.39	precipitation	Precipitation	✓

### Suggested Plot Services

Score	Plot Service	Feature
1.36	Accumulation of measurement over time at each grid point	WindFields <a href="#">Open in Giovanni</a>
1.36	Longitude-averaged Hovmoller, plotted over the selected time and latitude ranges	Hurricane Eye <a href="#">Open in Giovanni</a>

- Easy for external clients to consume services and build composite applications
- Don't need to know internal protocols and APIs of GES DISC applications
- Implement a single API - use with any service



# Challenges and limitations

- Lack of means for automatic discovery and reuse in JSON WSP
  - Lacks semantic information (some relief in OpenSearch GEO)
  - Can't specify acceptable required/optional combinations for args
  - Needs better customization
- Rigid communication protocol in OGC WPS
  - Does not specify retrieval of intermediate results
  - Can not process / display results of long-running jobs until complete (no piping)



# Summary

- New interface provides a simple and modern user experience, replacing and integrating with a number of legacy data services and applications at GES DISC
- Service-based implementation takes advantage of modern technologies and standards
  - High maintainability, evolvability, and forward compatibility
- Services are easy to reuse by partner applications
  - Search, Subset, Regrid, Format
  - Visualization (coming soon)